Examples of the use of ε

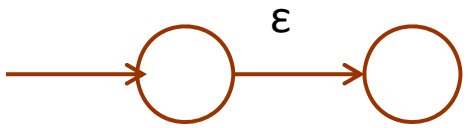
- <int> = d d *
- <real> = <int> (ε | “.” <int>)
  - Short-notation: <int> (“.” <int>)?
  - Equivalent to <int> | <int> “.” <int>
- <num> = <real> (ε | (E | e) (+ | - | ε) <int>)

From regular expression to finite automaton
Three methods

- (a) RE → NFA
- (b) RE → NFA → DFA
- (c) RE → DFA

- (a) RE → NFA
- The basic elements
  - "a"

  - ε

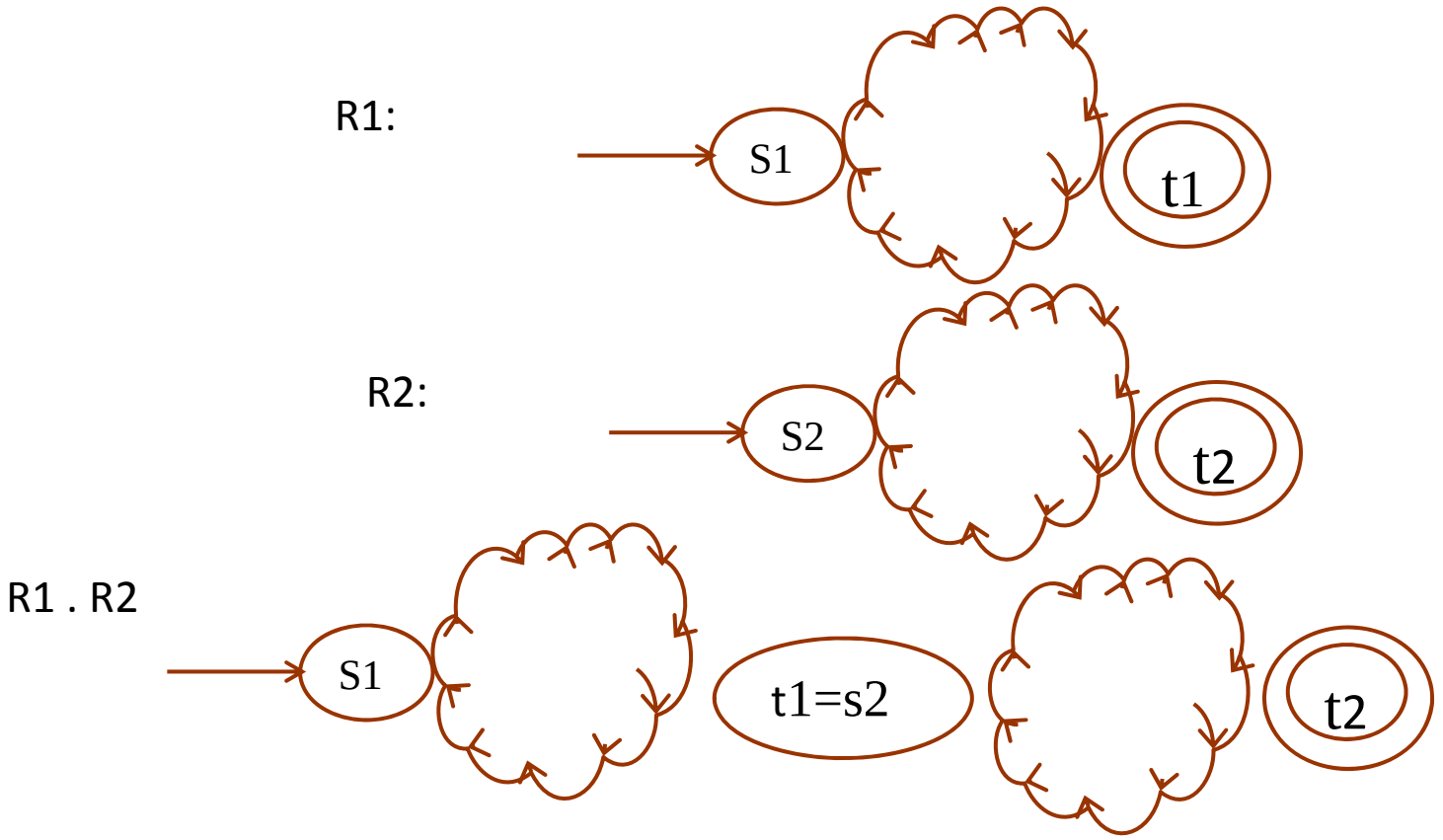


Compositions

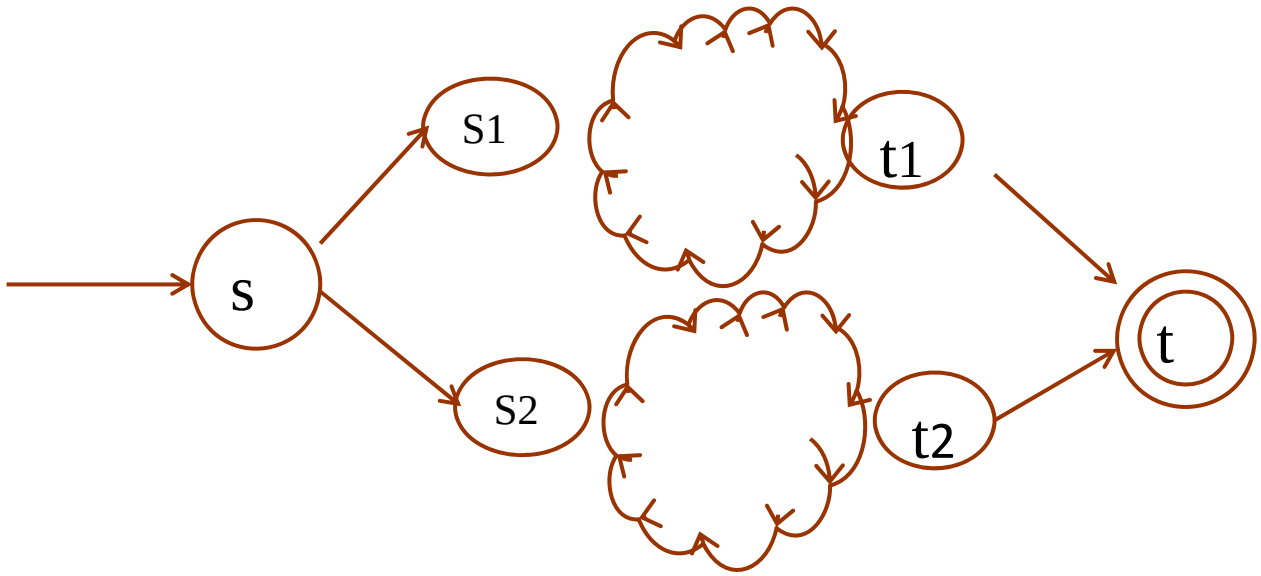
Every step ensures a unique edge to the starting state
and a unique accepting state

- Concatenation

Given:

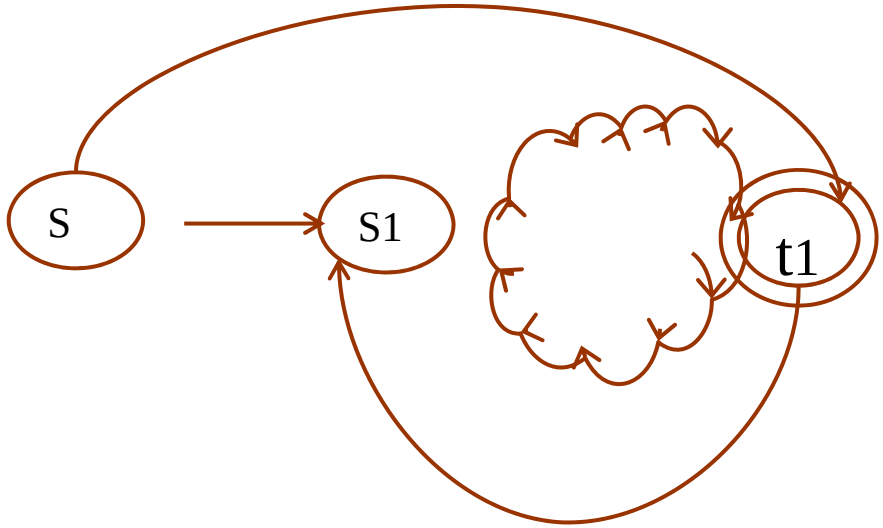


R1 | R2:



Notice: four ε edges are added

(R1)* :



- Let us illustrate a few steps of applying the Thompson's rule to the regular expression for <int> and <real>
  - For <real>, consider both <int> (ε | "." <int>) and <int> | <int> "." <int>
- Next, we show examples of following an NFA to perform lexical analysis
- Lastly, we show examples of converting NFA → DFA
- Note: during the construction of NFA, we are actually traversing the AST of the given regular expression in a bottom-up order (depth-first search, post-propocessing)